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ABSTRACT

The case study examines the effects on the receptive and expressive English language of a deaf 14 year old after a period of limited language immersion using Cued Speech, in which every sound in a word is represented both expressively and receptively. In a four week period the S spent approximately 14 hours per week with a modeler who cued speech throughout a range of activities. Results of tests measuring expression, comprehension, reception and syntax, indicated that accuracy in receiving cued sentences improved from pre- to posttesting, although reception of cued syllables and words was much more accurate in pretesting than reception of sentences: cued speech functioned as a clear representation of spoken English while it did not appreciably supplement the S's auditory processing of speech: the rate of cued speech expression improved markedly: and there was slight evidence to indicate improvement in English syntax. (CL)

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Limited Immersion in Cued Speech:

A Case Study

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Limited Immersion in Cued Speech:

A Case Study

The purpose of the case study described here is to evaluate the effects on the receptive and expressive English language of a deaf adolescent after a period of limited language immersion using Cued Speech. Limited immersion is defined as exposing a learner for a limited period to the target language--in this case, English--in a natural or conversational setting, during which time the learner is required to make responses using the target language. The subject is not formally taught or drilled in usage of the language; rather, the method provides a receptive and expressive experience in settings approximating those in which people normally use their language.

In this case study, the communication modality employed in the language immersion was Cued Speech because it provides a clear visual representation of spoken English for hearing impaired persons by representing every sound in a word both expressively and receptively. It is a system designed to aid comprehension of the sounds of spoken English by combining lip reading with a set of hand signals or "cues." Cued Speech uses hand positions and configurations in conjunction with lip movements to aid in distinguishing sounds. A complete description of the Cued Speech system is provided by Cornett (1967)[1] and in various publications of the Cued Speech Office of Gallaudet College.

Cued Speech is designed to provide the opportunity for deaf persons, even those with poorly developed speech, to build a knowledge of the English phonological sound system. There are distinct subpopulations of hearing impaired students with whom Cued Speech could be used: as an entry into the English

sound system for those with little proficiency in English; as a means of communicating in spoken English for those with a degree of proficiency in written English; as a tool to improve articulation and reduce deficiencies in the syntax of spoken language for those with relatively well-developed speaking proficiency. The subject in this study represented the third subpopulation.

In examining the effects of limited immersion with Cued Speech in the case study reported here, the following three questions were examined:

1. Would the learner demonstrate measurable improvement in receptive and expressive Cued Speech?
2. Would the learner demonstrate measurable improvement in correctly expressing and comprehending English, particularly in identified areas of deficiency prior to immersion?
3. Would the learner demonstrate measurable improvement in phonological awareness and accuracy in expressing English sounds and syllables?

Participants

Subject

The subject of the study was a 14-year-old student at the Model Secondary School for the Deaf. Prenatal rubella probably accounted for his speech reception threshold of 82 dB in both ears. On the WISC performance scale, his IQ measured 92. Table 1 presents data on the achievement test results which indicate that his language achievement level was low.

Insert Table 1 about here

This particular student was chosen for the study because: (1) he had basic competence in spoken English, including a high level of phonological knowledge and articulatory and auditory skill; (2) he had completed an Introductory Cued Speech course, so he already knew the basics of Cued Speech;

Table 1

Language and Achievement Test Data
for Subject of Limited Immersion Project

Test	Age When Tested	Tested Grade Level
Peabody Individual Achievement		
Reading Achievement	13.4	4.8
Reading Comprehension	13.4	4.0
Stanford Achievement		
Word Meaning	14.9	4.1
Paragraph Meaning	14.9	4.0
Northwestern Syntax Sentence	14.9	6.2
Peabody Picture Vocabulary	14.9	7.1

(3) he was well motivated to use Cued Speech and to improve his command of oral English; and (4) his parents had begun learning Cued Speech.

An audiologist charaterized the subject as "having a moderate, bilaterally symmetrical sensori-neural loss of hearing sensitivity." He was fitted with a Qualitone TSP hearing aid in his better ear, but wore it infrequently. His aided speech discrimination score was 80%. His audiological report further states: "At normal conversational loudness level, (measures of speech discrimination) yield fair scores in quiet, but poorer scores in a competing message situation. The latter approximates (the subject's) everyday listening environment."

The subject's speech was characterized as ". . . easily understood. His speech does exhibit some voice and/or articulation errors." On the MacDonald Deep Screening Test of Articulation he made only one error--substitution of an (s) for a (th). His overall articulation was characterized by some lateral emissions of (s) phonemes in all positions.

Before the project began, the subject was videotaped in a conversation where he used Cued Speech. Table 2 catalogues his grammatical errors: he frequently omitted word-final (s) and (z) morphophonemes; e.g., the regular (s, x) plural ending, third person present singular (s) or (z) verb endings, and the (s) contraction of <u>is</u> with pronouns and expletives. Auditorily, (s) is simply high frequency noise and is difficult to perceive when the auditory input is degraded as in hearing loss. The subject also produced some errors in using function words, especially prepositions, and showed a more restricted English vocabulary than might be expected from his articulatory and auditory proficiency.

<u>Insert Table 2 about here</u>

Table 2

Subject's Grammatical Errors in Spoken English
During Videotaped Conversation

Grammatical Element	Number of Occurences	Number of Omissions or Errors
Final (s) or (z) used as grammatical marker:		
Plural (s) or (z)	8	5 (62%)
Third person (s) or (z)	1	1 (100%)
Contracted <u>is</u>	3	3 (100%)
Prepositional phrase usage	19	4 (21%)

The study was an attempt to improve the subject's English language expression in the above areas of deficiency and to broaden his useful English language vocabulary.

The subject was fluent in the use of signs which he regularly used in communicating with his peers. It was hypothesized that his sign language knowledge might interfere with English language performance. The tutor, or modeler, noted during the course of the project that the subject's spoken English was much more grammatical when accompanied by cueing than when accompanied by signing. Therefore, one rationale for using Cued Speech as a communication mode for English language development is that it does not introduce elements from American Sign Language into English usage.

Modeler

The tutor, or modeler, for the project was a hard of hearing high school senior who had been a volunteer aide at the MSSD for one year prior to the initiation of the project. She was fluent in both English and signing, as well as in cueing.

For four weeks, the subject spent approximately 14 hours a week with the modeler, two hours on each of two days, and four hours on each of three other days each week. There was no specified curriculum, but various activities included field trips, word and guessing games, and written descriptions of activities. The majority of the time was spent in the modeler's home, where she cued everything she said and encouraged the subject to cue as much as possible when he spoke. The modeler prepared weekly progress reports and the modeler-subject interaction was recorded on an audio tape recorder at least once each week. The speech of the modeler and the subject proved sufficiently clear to render tape recording feasible.

The entire project lasted seven weeks, with the first and last weeks largely devoted to testing. The modeler and the subject worked together for four weeks. During the sixth week of the study the subject left for a vacation. Both parents had normal hearing, but as they were still learning Cued Speech, their proficiency was at a much lower level than that of their son.

Testing

The subject was tested before and after the completion of the experimental part of the project, and various measures were obtained to provide data bearing on the questions posed for the case study.

Measures of Receptive and Expressive Cued Speech Proficiency: Three measures of Cued Speech proficiency were obtained: (1) accuracy of reception was measured by presenting nonsense syllables, isolated words, and isolated sentences to the subject. All presentations compared reception of cued and non-cued stimuli. The subject repeated the stimuli as he perceived it. Cued stimuli were cued back and non-cued stimuli were spoken back. The subject's videotaped response was compared to the original stimulus to obtain the measure of receptive accuracy. Accuracy of cued expression was measured by the proportion of cueing errors (number of words incorrectly cued of the number of cued words); a cueing error was recorded when the subject's spoken response was correct but the accompanying cue was incorrect. Rate of cued expression was measured by recording the amount of time per utterance in the subject's videotaped cued responses.

The stimuli for the three measures of Cued Speech proficiency were:

(1) A list of 50 consonant-vowel-consonant (C-V-C) nonsense syllables, a list of 50 monosyllabic words, and eight lists of 10 sentences each were used to measure receptive accuracy. The nonsense syllables were generated from a

random numbers table to form consonant-vowel-consonant combinations (e.g., C-V-C combinations that do not occur naturally in English [nget]) were discarded.

Each nonsense syllable was presented twice to the subject in a 100-syllable stimulus list, once for speechreading and once for cueing. The stimulus list was balanced so that five of every 10 items were cued and five were speechread. In both the speechread and the cued situations the syllables were pronounced silently. It had been determined previously that the subject made few errors when he could hear the stimulus, so his error rate would not have been high enough to show improvement. The use of silent pronunciation of the syllables was a measure of speechreading and Cued Speech reception without auditory input. The same list was used in both pre-testing and post-testing.

(2) The list of monosyllabic English words was selected from audiobiological test lists and word frequency lists. All selected words had a high frequency of occurrence in English. Each word was repeated once for speechreading and once for cueing in a stimulus list of 100 words, balanced for order in the same manner as the nonsense syllable stimulus list.

(3) The lists of sentences were prepared at the Central Institute for the Deaf (David and Silverman, 1970) and designed to meet several criteria--chiefly, to be representative of conversational English using high frequency words and non-slang idioms. Eight lists of 10 sentences each were used.

There were four stimulus situations: spoken with cues, spoken without cues, silent pronunciation with cues, and silent pronunciation without cues. There were four sets of 10 sentences for each condition, presented in an ABBA order (A, non-cued; B, cued). The sentence reception was scored as the number of key words repeated correctly (redundant words such as highly predictable articles and idiom units were not scored). There were 50 scored words for

each sentence set. The reason for including the "spoken with and without cues" condition was to determine if use of cues would supplement the subject's hearing and decrease his error rate. All of the subject's responses were videotaped.

Included in both pre-testing and post-testing was a videotaped, unstructured conversation of approximately 10 minutes between the modeler and the subject concerning the subject's recent personal experiences. One measure obtained from the tapes was the proportion of cueing errors made. Measures of the rate of cued expression were obtained by counting the number of words and the amount of time per utterance of cued expressions in the videotaped pre-test and post-test conversation.

Measures of Expression and Comprehension of English: Information on the subject's performance in writing and in reading comprehension was obtained during the pre-testing and post-testing. Written English measures included analyses of usage, of errors in usage, and of average complexity of syntactic structure. Measures of recall of the content of two passages were used to estimate reading comprehension.

Two pre-test and two post-test writing samples describing the content of previously read passages were collected. All the reading passages (sixth-grade level using the Fry readability formula) were similar in content. The subject was allowed unlimited time to read the passages and was instructed to write as much as he could remember of their content. Written recall for non-verbal films also was obtained for the pre-tests and post-tests. The subject's spoken grammar using Cued Speech was analyzed from pre- and post-test videotaped conversations.

Syntactic Analyses: Analytic procedures developed as part of a comprehensive language evaluation program were used to determine the usage, grammatical

functioning, and errors in usage of eight major constituents. The structures analyzed were: (1) verb phrases; (2) nominal phrases including article usage; (3) adjectives; (4) adverbs; (5) dependent verbs, such as infinitive and participle phrases; (6) subordinate clauses; (7) prepositional phrases; and (8) determiners, such as the quantifiers all and many. The analysis of each of these categories included information, where appropriate, about the type of structures that occurred (e.g., the number of times past tense verb forms were used); the semantic classification of the structure that occured (e.g., nominal with social reference); the function the structure performed in the sentence (e.g., subject, predicate, modifier); types of errors that were made in using the structure; and the number of modifiers that were used in the structure. Errors were broadly classified as: omissions of needed constituents; semantic errors, for which the sentence was too ambiguous or nonsensical to be interpreted clearly; grammatical structure error, for which the subject used a semantically interpretable but ill-formed structure; and lexical selection errors, in which the wrong lexical item was inserted in a syntactic construction. In addition, some of the analyzed categories have types of errors peculiar to the category, such as errors in using pronouns in nominal phrase usage. The results of the syntactic analysis of the post-test samples were compared with pre-test samples for evidence of increased complexity or greater use of a particular structures.

The videotaped conversations were syntactically analyzed somewhat differently than the writing samples. Because conversational language is often fragmented, other types of syntactic scoring are necessary, such as Lee and Canter's Developmental Sentence Scoring (1971)[2]. A second analysis involved a count of the number in spoken samples. A verb phrase, for example, with two

modifers (adverbs of time and place) is more complex than a verb phrase with a single adverbial modifier. The number of single and multiple modifiers was computed to determine if the average complexity of spoken English had increased from pre-test to post-test.

Cloze Procedure: A modified form of the Cloze procedure was used as an estimate of the subject's ability to use grammatical information in context. In the standard form of the Cloze procedure, every nth word (e.g., every third or fifth word) in a text is deleted and the subject guesses the deleted word. In the altered form of the Cloze procedure used here, every instance of a particular syntactic class was deleted. There were two stimulus texts, one with all prepositions deleted and the other with all articles and pronouns deleted. The same deleted texts were used in pre-testing and post-testing. The number of incorrect substitutions was counted and the degree of deviance of incorrect substitutions measured.

Comprehension Measure: The written recall of the reading selections was used to obtain an estimate of reading comprehension. The sentences of the stimulus passage were reduced to subject-predicate kernels including the important content of the sentence. Those kernels stating unimportant details, asides, and other generalities were eliminated, so that only the content judged essential by the experimenter was included in the kernels. Each sentence that the subject wrote in his recall of the reading passage was scored as: (1) completely and correctly matching one of the kernel sentences; (2) correctly, but incompletely, matching one of the kernels (i.e., that a portion of the important part of a kernel was incorrectly recalled); (3) correct, but not matching one of the kernels (i.e., the subject's recall was of an unimportant detail, was an extrapolation beyond the actual content of the passage,

was a personal comment, or was an interpretation); or (4) incorrect, not matching the kernels (i.e., the subject's recall was completely incorrect).

Recall of the pre-test and post-test reading selections was determined by the number of the subject's recall sentences which fell into each of the above categories.

Phonological Awareness: Taped recordings of the subject-modeler sessions were analyzed for quantitative data on certain variables within the language-learning situation. Three areas of syntactic deficiency had been identified in the subject's videotaped pre-test conversation: omission of the (s) or (z) ending in regular plural formation, in the third person present singular form of the verb, and in the contracted form of is. The number of presentations of these forms by the modeler, the correct occurrences of these forms in the subject's speech, and the number of incorrect occurrences in the transcripts of the audio tapes were tallied. Any syntactic error of the subject and/or correction by the modeler not categorized above also was counted. In addition, the modeler wrote weekly progress reports which proved useful in obtaining subjective information on the subject's performance and motivation.

Results are reported and discussed in relation to the three questions posed for study.

Question 1

Three types of measures were employed to determine if the learner demonstrated improvement in receptive and expressive Cued Speech proficiency: accuracy in repeating cued syllables, words, and sentences (accuracy of reception); the average time taken to express a cued utterance (rate of expression); and the proportion of words erroneously cued (accuracy of expression). The data are summarized in Tables 3 and 4.

Insert Tables 3 and 4 about here

Table 3

Accuracy of Reception of Cued and Non-Cued Stimuli

Stimuli	Number and Percentage Correct	
	Pre-test	Post-test
Nonsense Syllables		
Spoken with cues	48 (96%)	
Spoken without cues	42 (84%)	
Cued without voice	43 (86%)	44 (88%)
Non-cued without voice (speechread)	19 (38%)	17 (34%)
Words		
Cued without voice	42 (84%)	40 (80%)
Non-cued without voice (speechread)	22 (44%)	15 (30%)
Keywords in Sentences		
Cued with voice	91 (91%)	
Non-cued with voice	90 (90%)	
Cued without voice	65 (65%)	84 (84%)
Non-cued without voice (speechread)	19 (19%)	43 (43%)

Table 4

Type of Activity	Rate (Words/Second)		Percentage Cueing Errors	
	Pre-test	Post-test	Pre-test	Post-test
Sentence Repetition	.42	.55	35	18
Conversation	.26	.66	31	11

The results support the following conclusions:

1. Accuracy in receiving cued sentences improved in post-testing over pre-testing (Table 3); however, receptive accuracy for cued syllables and words did not improve. Reception of cued syllables and words was much more accurate in pre-testing (80, or 88%) than reception of sentences (62, or 68%). This indicates that although the subject's ability to receive cued words was already at a high level because of prior training, the project did, nevertheless, improve his ability to receive cued strings of words in sentences, which was a major goal of the study.

2. Cued Speech functioned as a clear representation of spoken English for the subject. Even without the aid of auditory input, the results of pre-testing and post-testing show that he was able to perceive cued English words and sentences at a high level of accuracy. Similarly, measures of cueing accuracy indicated that even in conversation he was able to represent the phonological structure of English words 90% of the time (Table 4). Table 4 presents the rates of expressing cued utterances and the percentage of words cued incorrectly when repeating stimulus sentences and in the videotaped conversations.

3. The results of the reception test show that Cued Speech did not appreciably supplement the subject's auditory processing of speech, but that it did measurably supplement his nonauditory speechreading. Use of cues improved his auditory reception of syllables; but for words and sentences, language familiarity resulted in error rates too low to show marked improvement. Receptive accuracy for cued syllables, words, and sentences was much higher than when speechread alone. Whether or not the subject's exposure to Cued Speech improved measurably his ability to read lips without cues is left ambiguous by the data. The considerable improvement (from 19% to 43%) in speech-

reading accuracy for sentences from pre-test to post-test is positive, but because of the very limited sampling and the decrease in speechreading accuracy for words, no conclusion can be drawn.

4. The rate and accuracy of the subject's Cued Speech expression did improve measurably. The strongest supporting evidence is the rate and cueing error measures from the videotaped pre-test and post-test conversations shown in Table 4. The rate of expression increased from .26 words per minute to .66 words per minute, while the error rate fell from 31% to only 11% of cued words. The rate of expression also rose and the error rate fell in pre-test and post-test sentence reception.

Therefore, the results support the conclusion that the subject's accuracy and fluency in expressing and receiving Cued Speech would improve during the course of the project.

Question 2

The second question related to whether measurable improvement would occur in expression and comprehension of English, especially in areas of English syntactic usage in which the subject showed deficiencies as determined by pre-testing.

Insert Tables 5 and 6 about here

Data was obtained from pre-test and post-test measures of syntactic usage and errors in usage of written and spoken English. There was no noticeable improvement in the subject's written English. The overall accuracy in using eight analyzed syntactic constituents or constructions is not generally higher in the post-testing writing samples (Table 5). Although there are sometimes large differences in distribution of usage within each of the eight categories (Table 6), one should probably attribute them to characteristics of the sampling (e.g., differences in topic), rather than as a treatment result in

Table 5

Number of Syntactic Constructions and
Percentage of Correct Occurences in Written Discourse

Written Constructions	Number & Percentage on Pre-test	Number & Percentage on Post-test
Nominal Phrases	149 (79%)	165 (84%)
Verb Phrases	83 (74%)	78 (76%)
Dependent Verbs	18 (83%)	18 (89%)
Prepositional Phrases	38 (76%)	43 (74%)
Adverbs	18 (94%)	20 (80%)
Adjectives	20 (95%)	13 (93%)
Subordinate Clauses	23 (91%)	13 (77%)
Determiners	32 (82%)	14 (57%)

Table 6

Number and Percentage of Total Occurrences of the Eight Subtypes of Grammatical Constituents in Subject's Written Discourse

Subtypes of Grammatical Constituents	Number & Percentage in Pre-test	Number & Percentage in Post-test
1. Subtypes of Verb Phrase		
Simple Present	20 (24%)	2 (3%)
Simple Past	43 (52%)	67 (86%)
Present Progressive	1 (1%)	0 (0%)
Past Progressive	6 (7%)	0 (0%)
Present Perfect	1 (1%)	0 (0%)
Past Perfect	1 (1%)	2 (3%)
Present Perfect Progressive	1 (1%)	0 (0%)
Past Passive	0 (0%)	3 (4%)
Present Modal	5 (6%)	2 (3%)
Past Modal	3 (4%)	1 (1%)
Present Semi-modal	1 (1%)	0 (0%)
Past Semi-modal	0 (0%)	1 (1%)
Past Semi-modal	1 (1%)	0 (0%)
Did + Negative	1 (1%)	0 (0%)
2. Subtypes of Prepositional Phrases		
Locational	11 (29%)	25 (58%)
Temporal	5 (13%)	0 (0%)
Manner/Means	2 (5%)	3 (7%)
Cause/Result	0 (0%)	8 (18%)
Prepositional Verb	1 (3%)	1 (2%)

Table 6 (Continued)

Subtypes of Grammatical Constituents	Number & Percentage in Pre-test	Number & Percentage in Post-test
Subject Matter	2 (5%)	1 (2%)
Comparative	1 (3%)	2 (5%)
Possessive	5 (13%)	1 (2%)
Partitive	8 (21%)	1 (2%)
Postnominal	1 (3%)	1 (0%)
Complementary	2 (5%)	1 (2%)
3. Subtypes of Dependent Verbs		
Infinitive	2 (11%)	2 (11%)
Infinitive to	2 (11%)	2 (11%)
ING Form	5 (28%)	5 (28%)
Participal Form	1 (6%)	0 (0%)
Purposive	3 (17%)	5 (28%)
4. Subtypes of Adverbs		
Place	6 (33%)	11 (55%)
Time	3 (17%)	3 (15%)
Process	1 (6%)	1 (5%)
Focus	6 (33%)	3 (15%)
Intensity	2 (11%)	2 (10%)
Viewpoint	0 (0%)	0 (0%)
Comparsion	0 (0%)	0 (0%)
Subject	0 (0%)	0 (0%)

Table 6 (Continued)

Subtypes of Grammatical Constituents	Number & Percentage in Pre-test	Number & Percentage in Post-test
5. Subtypes of Adjectives		
Intensifiers	0 (0%)	0 (0%)
Postdeterminers	0 (0%)	0 (0%)
Subjective Measurers	17 (85%)	5 (38%)
Objective Measurers	2 (10%)	4 (31%)
Abstractions	1 (5%)	4 (31%)
6. Subtypes of Subordinate Clauses		
Place	0 (0%)	1 (8%)
Time	5 (22%)	2 (15%)
Manner	0 (0%)	0 (0%)
Reason	7 (30%)	7 (54%)
Condition	3 (13%)	0 (0%)
Comparsion	0 (0%)	0 (0%)
That - Comp.	6 (26%)	0 (0%)
Nom. Post.	0 (0%)	0 (0%)
Interrogative	2 (9%)	3 (23%)
7. Subtypes of Determiners		
Negatives	0 (0%)	0 (0%)
Positives	2 (6%)	4 (29%)
Demonstratives	4 (12%)	3 (21%)
Possessive Pronouns	10 (31%)	5 (36%)
Pre-articles	0 (0%)	0 (0%)

Table 6 (Continued)

Subtypes of Grammatical Constituents	Number & Percentage in Pre-test	Number & Percentage in Post-test
Ordinals	5 (16%)	0 (0%)
Cardinals	5 (16%)	1 (7%)
Quantifiers and Partitives	6 (19%)	1 (7%)

the absence of further information. The results of substitutions in the Cloze procedure again showed no improved performance in post-testing over pre-testing (Table 7).

Insert Table 7 about here

Although the communication during the project was almost entirely in a form of spoken English, in conceptualizing results of the study it had been assumed that the project would have a measurable impact on the subject's written English. In retrospect, this expectation appears to have been unwarranted. The subject's written grammar deviates significantly from that of his spoken English. He writes sentences which are much more deviant than those he would say. The attempt, therefore, to show measurable improvement in writing and reading English was misplaced. The subject belongs to a subpopulation of deaf students with good speaking knowledge of English, but low achievement in writing and reading English. To get students to apply their reading and writing is a problem entirely different from the nature of the research questions under investigation here.

The measure of spoken English offers slight evidence to indicate improvement in English syntax. Although the overall number of errors in the target deficiency areas decreased (Table 8), the sample sizes are too small to draw conclusions. A t-test was done on the Developmental Sentence Scores for pre-test and post-test conversations and showed a nonsignificant difference. The measures of modificational complexity (Table 9) showed more use of modificational structures per phrase in the pre-test than in the post-test, rather than the expected reverse.

Insert Tables 8 and 9 about here

Table 7

Number of Prepositions, Articles, and Correctly Used Pronouns; Number and Type of Incorrect Substitutions; and Number of Omissions in Modified Cloze Samples

Parts of Speech	Performance	Pre-test	Post-test
Prepositions:	Correct	56	61
	Omissions	6	18
	Substitution of nonpreposition	12	3
	Substitution of wrong preposition	26	18
Articles and Pronouns:	Correct	69	66
	Omissions	5	7
	Substitution of nonarticle or nonpronoun	8	12
	Substitution of wrong article or pronoun	17	15

Table 8

Errors in Targeted Syntactic Areas
and Pronunciation Errors in Pre- and Post-testing

Errors in Pronunciation and Syntax	Pre-test Number of Occurences	Pre-test Number of Omissions	Post-test Number of Occurences	Post-test Number of Omissions
Plural (s) or (z) ending	15	8 (53%)	9	4 (44%)
Third Person Singular (s) or (z)	3	1 (33%)	6	4 (67%)
Contracted *is*	14	8 (57%)	8	2 (25%)
Prepositional Usage	19	4 (21%)	20	1 (5%)

Table 9

Modificational Complexity of Nominal and Verb Phrases in Pre- and Post-test Videotaped Conversations

Type of Phrase	Complexity	Number and Percentages Pre-test	Post-test
Nominal Phrases:	Unmodified	33 (60%)	60 (73%)
	Singly premodified	20 (36%)	18 (22%)
	Singly postmodified	2 (4%)	1 (1%)
	Singly premodified and postmodified	0 (0%)	2 (2%)
	Multiply premodified	0 (0%)	1 (1%)
Verb Phrases:	No adjunct	7 (28%)	20 (43%)
	Singly adjunct	11 (44%)	19 (41%)
	Two adjuncts	6 (24%)	6 (13%)
	Three or more adjuncts	1 (4%)	1 (2%)

There are two senses in which language could be said to have improved in this setting: (1) if the subject corrected specific grammatical constructions, in this case omission of plural endings; and (2) if he showed a generalized improvement in language usage such as an increased willingness to use language, improved vocabulary, etc. The tabulation of correct and incorrect occurrences of (s) and (z) endings in pre-test and post-test conversations, and the syntactic analysis of the writing samples, are measures of specific language improvement, while the Developmental Sentence Score and the measures of comprehension (Table 10) were intended to be more general language improvement measures. From the theories and discoveries discussed in the Language Learning Process, it could be predicted that the immersion method would affect general language improvement more strongly than specific language improvement. The measures under specific language improvement were not adequately measured and the project was of so brief a duration that the conclusion is warranted that general language improvement was not affected measurably in this case.

Insert Table 10 about here

Question 3

The third question dealt with whether the subject's phonological awareness and accuracy in expressing English sounds and syllables would show measurable improvement. Unfortunately, the only direct measure related to this hypothesis was judged inadequate and not included in post-testing. The subject's percentage of cueing errors, which includes momentary forgetting and carelessness as well as true phonological representation errors, was low in the post-testing conversation, indicating that he has the ability to benefit from use of cues to represent phonological information in English. One of the strongest reasons for using Cued Speech as a mode of spoken English is that it improves phono-

Table 10

Propositional Recall in Pre-test and Post-test Comprehension Tests

Number and Degree of Propositions Specified	Recall			
	Pre-test 1	Pre-test 2	Post-test 1	Post-test 2
Number of Propositions in Stimulus	76	66	75	62
Number of Propositions Completely Specified	8 (11%)	3 (5%)	7 (9%)	6 (10%)
Incompletely Specified Propositions	1 (1%)	1 (2%)	1 (1%)	4 (6%)
Additional Propositions Correctly Specified	1	0	2	4
Erroneously Specified Propositions	7	3	3	4
Additional Propositions Erroneously Specified	0	5	1	1

logical awareness and knowledge. In conclusion, because of inadequate measurement, the third question could not be answered.

Language-Learning Process

In keeping with the earlier discussions of language-learning variables in this report, frequency of modeling, subject responding, and modeler correction were tabulated in the tape-recorded subject-modeler sessions and are presented in Table 11. These results give a clearer picture of the nature of the language-learning process found in the immersion technique. An examination of the frequency of responses and corrections in the targeted syntactic deficiency areas indicates that although the total number of utterances a subject is exposed to and expresses during a session is large, the occurrence of models, responses, and corrections within specific areas is small. The capacity of an unstructured immersion process to correct specific grammatical deficiencies would seem to be limited to the extent that such correction depends on the frequency of responding and correction. One suggestion to effect correction of specific language deficiency would be to introduce structure with this specific aim: that is, to use patterned conversations and reinforcement of the occurrences of targeted utterances to increase the likelihood of their occurrence.

Insert Table 11 about here

Examination of the transcripts also showed that many of the corrections were aimed at improving general level of language usage, e.g., corrections of pronunciation, correction of the way a word was cued, definitions of words. These types of corrections have greater potential for occurrence in immersion settings than in others, and given enough time and adequate measures, the method should yield considerable improvement in these areas. One modification of the method to use this potential more effectively might be to provide

Table 11

Measures of Production, Modeling, and Feedback
in Subject-Modeler Sessions

Language Items	Learning Events	Number of Day 9	10	14	15	17	20
Plural (s) or (z):	Number of Models	33	12	37	20	6	20
	Subject's Utterances	8	2	5	8	7	5
	-Spontaneously Correct	1	0	4	4	4	5
	-Correct After Feedback	3	0	0	0	0	0
	-Incorrect	4	2	1	4	3	0
	Corrections by Modeler	3	1	1	3	1	0
Contracted is:	Number of Models	7	11	8	4	6	1
	Subject's Utterances	3	3	3	0	11	1
	-Spontaneously Correct	3	1	3	0	6	1
	-Correct After Feedback	0	1	0	0	2	0
	-Incorrect	0	1	0	0	3	0
	Corrections by Modeler	0	1	0	0	2	0
Third Person Singular (s) or (z):	Number of Models	7	3	3	2	3	0
	Subject's Utterances	0	2	0	1	6	1
	-Spontaneously Correct	0	2	0	1	4	0
	-Correct After Feedback	0	0	0	0	0	0
	-Incorrect	0	0	0	0	2	1
	Corrections by Modeler	0	0	0	0	0	0
Pronunciation:	Corrections by Modeler	2	5	1	5	6	2
Cue Formation:	Corrections by Modeler	2	6	8	10	8	2

students with a way to signal the occurrence of an unknown word immediately, or to ask for the way to cue or to pronounce a word.

The project attempted to accomplish simultaneously two aims: to increase accuracy and fluency in using cues and to improve language performance. It is apparent now that the first aim must precede the second. The subject at the conclusion of the study was just attaining sufficient fluency in cueing to begin to use cues automatically. This is the point at which a concentration on improvement of language performance should begin.

The findings from this single case study using limited immersion with Cued Speech suggest several areas for more indepth investigation and for the programmatic use of this method as an aid to language learning.

The results of this study suggest two phases for a language development program that uses Cued Speech in an immersion setting, with focus in the initial phase on increasing the fluency and accuracy of cueing, so that the use of cues becomes as automatic as possible. The second phase of such a program would be concerned with language improvement per se.

Attempts should be made to modify each phase of the immersion method for these different specific aims. A suggestion for attaining cueing proficiency is to remove the auditory component by having modeler and subject cue everything with silent pronunciation. The subject in the present study received so much auditory information that he had little need to attend to the modeler's cues, and consequently got less practice in reading cues than was desired.

A modification of the second phase would be to introduce more structure to the sessions through modeler control. There is a need for more supervision and monitoring during the course of learning language. Unfortunately, information is lacking about the effects of systematic manipulation of the language learning variables with any method, to say nothing of the immersion method.

In addition, new and different language measures for Cued Speech studies need to be developed. The syntactic analysis of written and printed English must wholly be shifted to measure reception and expression of spoken and cued English. The instruments used here to measure phonological awareness and comprehension proved unsatisfactory. New measures in these areas need to be developed and additional measures of vocabulary development, phonological knowledge, phonetic articulation, and level of language usage need to be sought and developed.

A possible next step in research would be the initiation of an immersion course with four or five students who have completed an introductory course in Cued Speech. The course would be in a conversation or natural language situation, the first phase focusing on development of fluency and accuracy in silent use of cues, and the second phase on correction of specific language deficiencies and development of general language usage. Measurement would consist of pre-test and post-test measures of articulation, speechreading proficiency, receptive and expressive cueing proficiency, vocabulary knowledge, syntactic usage and deficiency, comprehension, and level of language usage. All measurements would be in spoken or cued English. Specific objectives would be stated for each student on the basis of pre-test results, and the success of the method would be judged in terms of its ability to achieve these goals for each student.

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